Experiment No: 02

Experiment Title: Practical Implementation of Twisted Pair and Coaxial Cable Connections with RJ45 Connector.

Objective:

The purpose of this experiment is to understand the construction and configuration of network cables, specifically twisted pair and coaxial cables, and to practice terminating twisted pair cables with RJ45 connectors for network communication.

Theory:

Twisted Pair Cables:

Twisted pair cables consist of pairs of insulated copper wires wound around each other to reduce interference. The twisting helps minimize signal degradation caused by electromagnetic interference (EMI) and crosstalk. These cables are extensively used in Ethernet and LAN setups. Two main categories exist:

- **UTP (Unshielded Twisted Pair):** Lightweight and economical, commonly used in office and home networks.
- **STP (Shielded Twisted Pair):** Designed with an additional shielding layer, making it suitable for environments with high interference.

Twisted pair cables use RJ45 connectors with 8 pins (supporting 4 wire pairs). The arrangement of wires follows standard wiring schemes, typically T568A or T568B.

Coaxial Cables:

Coaxial cables consist of a single copper conductor core, surrounded by dielectric insulation, a metallic shield, and an outer protective layer. They are mainly used in television distribution, broadband services, and CCTV systems due to their ability to transmit high-frequency signals with minimal signal loss over long distances. Unlike twisted pair cables, coaxial cables utilize connectors such as BNC, F-type, or RCA, not RJ45.

Equipment Required:

1. CAT-6 Twisted Pair Cable
2. RJ45 Connectors
3. Crimping Tool
4. Cable Tester
5. Router/Switch
6. Computer/Server

Figure-01: RJ45 Connector.

Figure-02: Crimping Tool.

Procedure:

Task 1: Straight-Through Cable Fabrication

1. Cut the required length of Cat-6 cable.
2. Strip approximately 2–3 cm of the cable jacket from both ends.
3. Untwist and align the wire pairs in the T568B sequence:
   -White/Orange, Orange, White/Green, Blue, White/Blue, Green, White/Brown, Brown.
4. Insert the wires into the RJ45 connector with the clip facing downward, ensuring they reach the front.
5. Crimp the connector firmly.
6. Repeat the same process for the other end of the cable.
7. Test the cable with a cable tester. If miswired, re-crimp until all connections are correct.

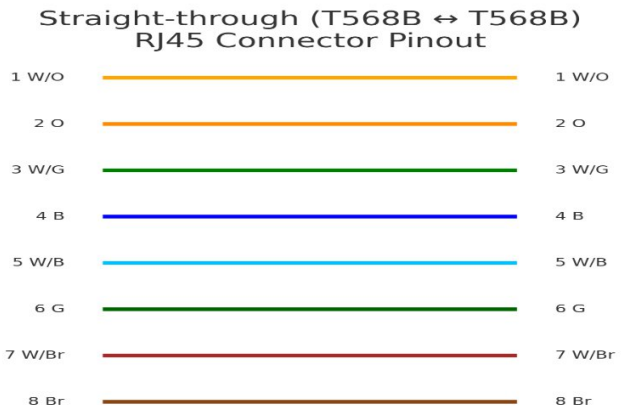

Figure-03: Straight-Cabling Connections.

Task 2: Crossover Cable Fabrication

1. Prepare a Cat-6 cable as above.

2. Arrange wires differently on each side:

- **Side 1 (T568B):** White/Orange, Orange, White/Green, Blue, White/Blue, Green, White/Brown, Brown.
- **Side 2 (T568A):** White/Green, Green, White/Orange, Blue, White/Blue, Orange, White/Brown, Brown.

3. Insert wires into connectors, crimp both ends, and test with the cable tester.

Crossover Cable Pin Configuration:

Pin	Side-1 (T568B)	Side-2 (T568A)
1	Orange-White	Green-White
2	Orange	Green
3	Green-White	Orange-White
4	Blue	Blue
5	Blue-White	Blue-White
6	Green	Orange
7	Brown-White	Brown-White
8	Brown	Brown

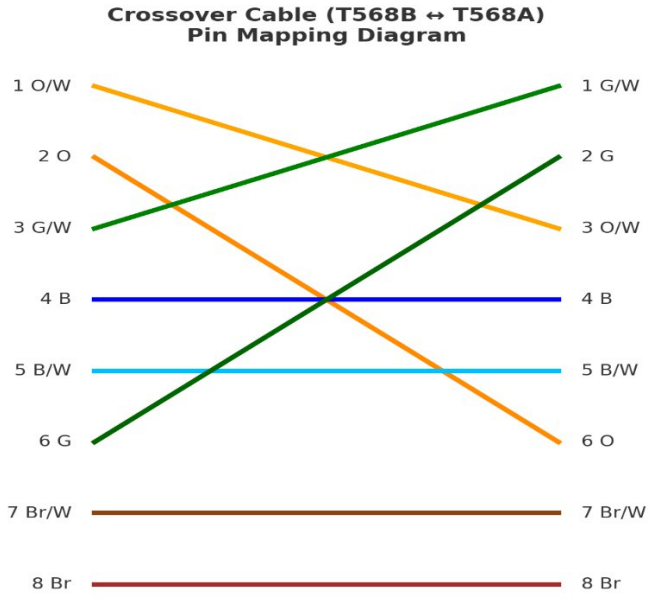

Figure-04: Cross-Cabling Connections.

Task 3: Connectivity Verification

1. Connect a straight cable between a PC and a router.

2. Connect a crossover cable between a router and another networking device (e.g., server or switch).

3. Ensure connections are firm and correct.

4. Verify internet or network connectivity by testing access.

Observations:

1. Straight cables enable communication between different device types (e.g., PC ↔ Router).

2. Crossover cables allow communication between similar devices (e.g., Switch ↔ Switch).

3. Correct pin alignment is essential to avoid communication failures.

Conclusion:

This experiment provided practical exposure to cable preparation, crimping, and testing. We learned the difference between straight-through and crossover cables, their applications, and the importance of wiring standards. By verifying internet connectivity, we confirmed that properly terminated cables are crucial for a stable and functional network.